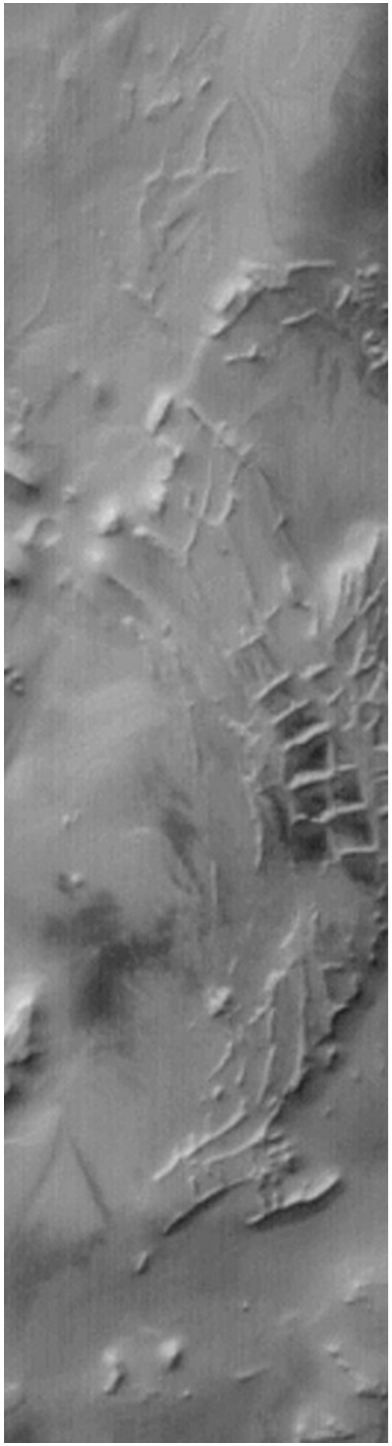

LaRC LESSONS LEARNED WORKSHOP

Lessons Learned from Soup to Nuts

from soliciting and vetting lesson candidates, to drafting a lesson, verifying the information, editing and approval, and infusion into Center procedures and training

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Lessons Learned as a "Contact Sport"

- A formal lessons learned process is a hallmark of a mature engineering organization
  1. High risk missions, often never flown before, often one-of-a-kind spacecraft or facilities
  2. Repeated mistakes, or violation of known best practices, pose a risk that is potentially avoidable
     - *NASA "has not demonstrated the characteristics of a 'learning organization'." Investigators observed mistakes being repeated and lessons from the past apparently being relearned."* –CAIB report, page 11
     - *"An expert is someone who knows some of the worst mistakes that can be made in his subject, and how to avoid them."* -Werner Karl Heisenberg
     - *"Fools say that they learn by experience, I prefer to profit by others' experience."* -Otto von Bismarck
     - *"Why - I learnt what one ought not to do, and that is always something."*
       - The Duke of Wellington describing the failed Dutch campaign of 1794
     - *"Learn or die!"* -Rob Johnson, Lessons Learned Program Mgr, TLA (3-letter acronym fed agency)
     - *The business of transferring lessons learned is best done as a 'contact sport'"* - Joe Nieberding (NASA Glenn Research Center, retired)
- Lessons learned is an effective countermeasure against avoidable risk

Lessons Learned Process Flow

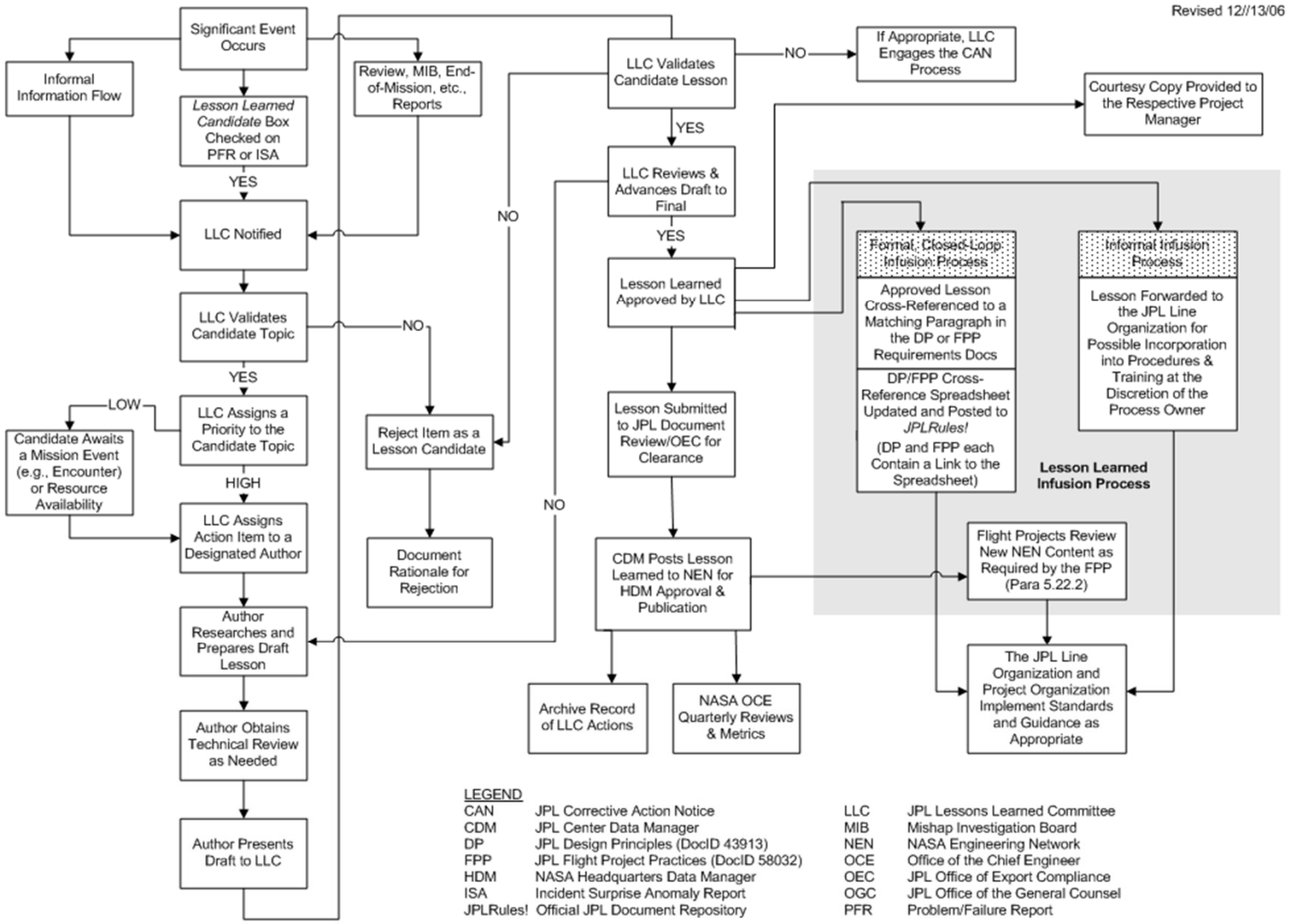

Figure 1. Lessons Learned Process Flowchart

Soliciting & Vetting Candidates

- Sources of lesson learned topics
  - Anomaly reports, mishap reports, informal office conversation, etc.
  - Include "*positive*" success factors as well as "*don't do this again*" items
- Vet each candidate as a valid lesson learned
  - Establish a set of criteria for a valid lesson learned
    1. Relevant to mission success
    2. Likely to be of interest to future projects
    3. Has not been covered in the LLIS
  - Have LLC prioritize the list (Low priority topics may drop off the list)
  - Avoid topics that are of interest only to specialists
  - Avoid topics that do not lend to "implementable" recommendations
  - Candidate may instead be a Center-wide corrective action or NASA Alert

Lesson Drafting & Verification

- How do you assure that a key lesson gets drafted?
  - "*If a job is everyone's responsibility, no one will do it.*" -Peter Drucker
  - All you really need from an contributor is a subject and a PRACA number!
- Verify the facts in the *Description of Driving Event* section
- Lessons learned should be well written
  - Consider using a single author for all draft lessons submitted to the LLC
  - Recommendations should be "implementable"– not motherhood & apple…
- Lessons Learned Committee performs real time "wordsmithing"
  - Opportunity to revalidate the candidate topic
  - The LLC reviews the draft line-by-line: "Does this photo really add anything"?
  - The LLC formally approves the lesson learned
  - Meeting minutes document LLC activity/action

Dissemination & Assuring Use

- Lessons learned system as a “data morgue”
  - 2002 GAO report: NASA not assuring that lessons get used
  - 2004 Diaz report: “Managers do not use the LLIS when making decisions.”
  - Are we doing better today?
- Lessons learned dissemination
  - LLIS has a subscription feature
  - JPL published all lessons in the LLIS, forwards lessons from other Centers, e-mail summaries to select JPLers
  - Are there useful metrics? (“*Not everything that can be counted counts, and not everything that counts can be counted*.” -Albert Einstein)
- At major project milestones, JPL flight projects self-audit their compliance with lesson learned
  - Mars Exploration Rover audited compliance with 364 JPL & GSFC lessons
  - Juno tracked compliance with 5 specific “high risk” lessons learned
  - Kepler project reviewed compliance with all (over 1100) NASA lessons
  - Such detailed review may not be cost-effective for smaller projects

Lessons Learned "Infusion"

- *Infuse* lessons into procedures and training such that the project need not depend on the right person reading a lesson at the appropriate project milestone
- Selected method: cross-reference lessons to specific paragraphs in the JPL *Design Principles* (DPs) and *Flight Project Practices* (FPPs). JPL Engineering Board vetted the cross-references
- Two objectives:
  - Infuse lessons learned, achieving a closed-loop lessons learned process
  - Provide additional rationale for the requirements in the DPs and FPPs
- Example: DP Para. 4.2.5.5. "Positive margins shall be demonstrated, for both of the following cases, with the application of a factor of safety of ___ for thermally-induced loading over the qualification/protoflight temperature range, and the application of a factor of safety of ___ over the allowable flight temperature range."

  NEN #2038 – "To Bond or to Bolt, That is the Question"